



NOTES

BUNYAVIRUSES

MICROBE OVERVIEW

- Bunyaviruses: RNA virus order
- AKA Bunyavirales

Genetic material

- Negative-sense, single-stranded RNA
- Tripartite genome
 - Large (L) segment (encodes RNA-polymerase); medium (M) segment (encodes surface glycoproteins); small (S) segment (encodes nucleocapsid proteins)

Morphology

- Enveloped (outer lipid membrane)
- Spherical
- Size: 90–100nm

Replication

- Host cytoplasm replication

Transmission

- Vector-borne, person-to-person, contact with reservoir (species-dependent)
- Reservoirs: arthropods, mammals (especially rodents)

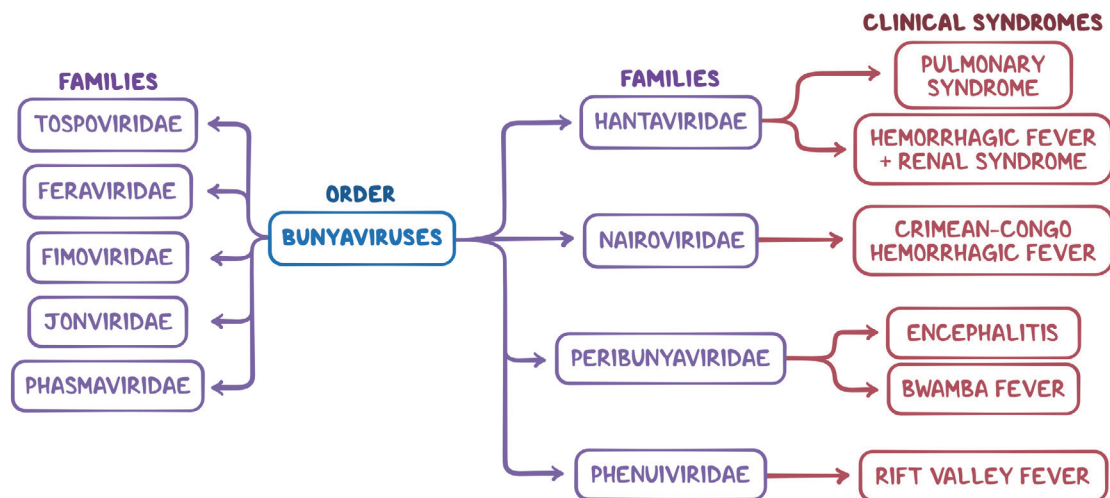


Figure 58.1 Families of the Bunyavirus order and associated clinical syndromes.

VISIT...

LANZAROTE
Caliente.COM

HANTAVIRUS

osms.it/hantavirus

PATHOLOGY & CAUSES

- Single-stranded RNA virus genus → causes severe renal/pulmonary disease
- AKA *Orthohantavirus*
- *Hantaviridae* family
- Reservoir
 - Rodents (mice, voles, shrews, rats)
- Incubation period
 - 9–33 days
- Tissue tropism
 - Lymphoid organ, heart, lung, kidney vascular endothelium
- Hantavirus inhalation → lung phagocytosis → transport to lymph nodes → hantavirus enters epithelial cells using beta-3 integrins → ↑ vascular permeability → dissemination
- Immune response
 - CD4+/CD8+ cytotoxic T cells, dendritic cells
- High-prevalence regions
 - China, Russia, Europe

Associated clinical syndromes

- Hemorrhagic fever + renal syndrome (“Old World” AKA Asia, Europe)

- ↑ vascular permeability → ↓ blood pressure → kidney endothelial dysfunction
- Hantavirus cardiopulmonary/pulmonary syndrome (“New World” AKA North, South America)
- ↑ vascular permeability → non-cardiogenic pulmonary edema

CAUSES

- Rodents (urine/feces/saliva particle inhalation); person-to-person (rare)

RISK FACTORS

- Rural indoor spaces (e.g. barns)
- Wild rodent exposure
- Smoking → Puumala virus infection risk
- ↑ risk among biological males

COMPLICATIONS

- Cardiogenic shock, pulmonary edema, arrhythmia, renal insufficiency, acute kidney injury (AKI), coagulopathy, disseminated intravascular dissemination (DIC), hemorrhage; high mortality rate

SPECIES OF HANTAVIRUS

	PUUMALA	DOBRAVA	HANTAAN	SEOUL	SIN NOMBRE	ANDES
GEOGRAPHIC LOCATION	Europe		Asia		U.S.	South America
SEVERITY	Mild	Severe				
NON-NRTIs	Renal				Cardiopulmonary	

SIGNS & SYMPTOMS

Pulmonary syndrome

- Systemic
 - Fever, chills, myalgia, headaches, weakness
- Nausea, vomiting, diarrhea, abdominal pain, cough, oliguria
- Sometimes conjunctivitis, flushing, petechiae

Hemorrhagic fever + renal syndrome

- Fever, hypotension, malaise, headache, diffuse hemorrhage (e.g. petechiae, melena, ecchymoses), abdominal/loin pain, nausea/vomiting, oliguria

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray

- Lungs: bilateral pulmonary infiltrates, pleural effusion

Abdominal ultrasound

- Kidneys: ↑ size, perirenal fluid

LAB RESULTS

- Reverse-transcriptase polymerase chain reaction (RT-PCR)

Tests

- **Diagnostic triad:** thrombocytopenia, ↑ immunoblasts (> 10%), left-shifted granulocytic series
- ↑ lactate dehydrogenase (LDH), serum lactate
- ↑ liver enzymes
- ↑ C-reactive protein
- Severe
 - ↑ hemoglobin, hematocrit; ↓ albumin; altered coagulation tests
- Renal syndrome
 - ↑ serum creatinine, ↓ glomerular filtration rate (GFR)

Serologic tests

- IgM/IgG detection through ELISA, strip immunoblot, Western blot, immunofluorescence

Urinalysis

- Renal syndrome: proteinuria, hematuria

Tissue biopsy

- Kidneys: edema, perirenal hemorrhage, tubular destruction
- Lungs: edema, mononuclear cell infiltrates, tracheal/pleural fluid, hyaline deposits
- Lymphoid organs: mononuclear cell infiltrates

TREATMENT

MEDICATIONS

- Renal syndrome antivirals
 - Nucleoside analogue

OTHER INTERVENTIONS

- ICU monitoring, mechanical ventilation
- Severe cases
 - Extracorporeal membrane oxygenation (ECMO), dialysis, platelet transfusion

Prevention

- Potential rodent nesting site removal (e.g. debris, garbage)
- Closed spaces ventilation
- Avoid rodent contact